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GB 2055712 A US 4892002 A US 4216842 A

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(54) Noise attenuation arrangement for the steering shaft of a motor vehicle

(57) The arrangement comprises a baffle 22 for the steering shaft 10 attachable between a shaft coupling 30 and the passenger compartment 16, the device 22 preferably being an integral unit comprising a baffle of noise absorbent material which accommodates the shaft coupling and a blanking plate 38 for an aperture in the vehicle structure through which the steering shaft 10 passes.

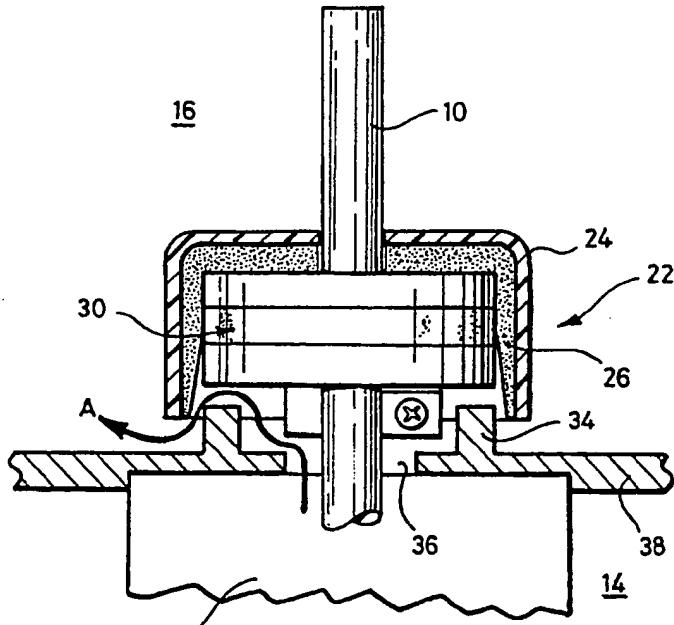


Fig. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

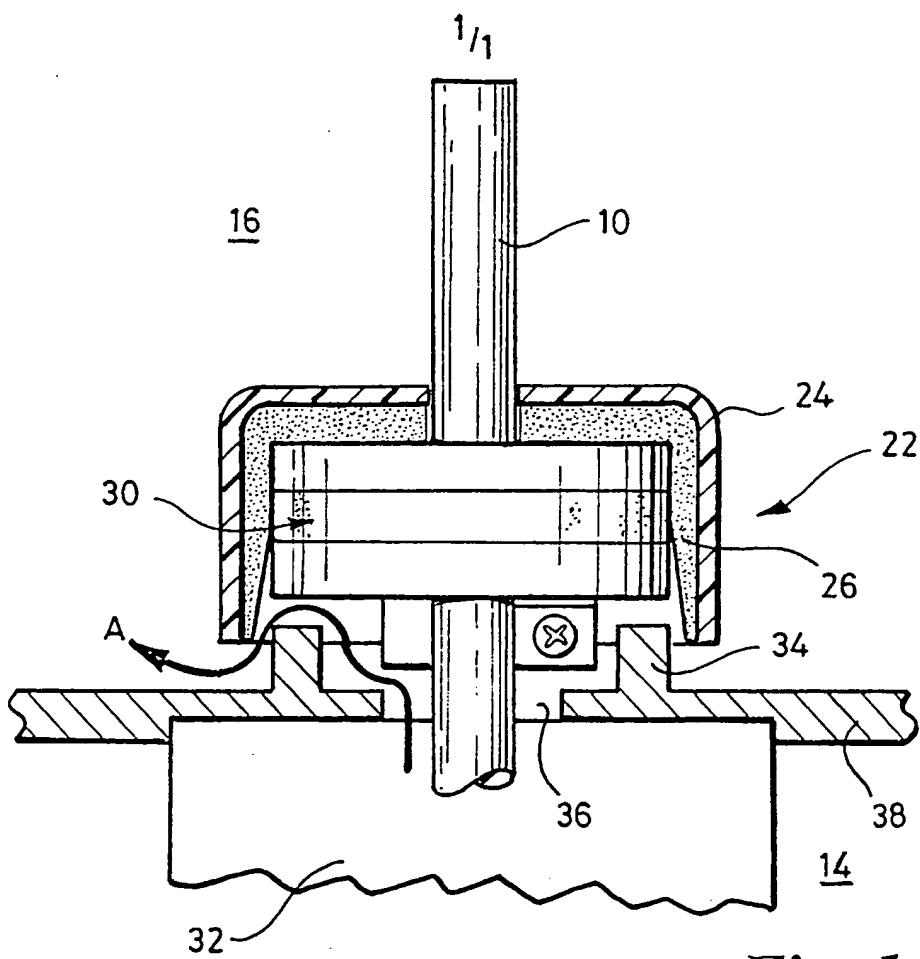


Fig. 1

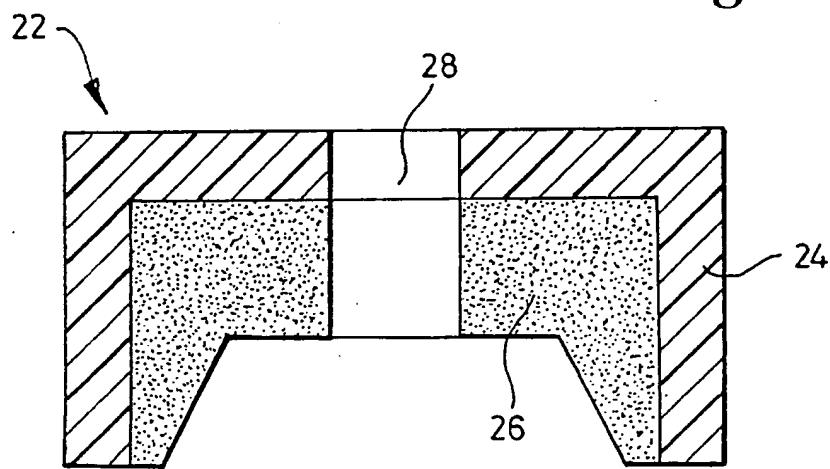


Fig. 2

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STEERING NOISE ATTENUATION ARRANGEMENT

The present invention relates to a noise attenuation arrangement for a steering shaft of a motor vehicle, and
5 more particularly to a motor vehicle with power assisted steering apparatus.

The power assistance of the steering apparatus of a motor vehicle is typically achieved by means of a hydraulic system. In use oil is pumped around a closed hydraulic circuit which includes a number of valves which typically emit a high pitched hissing or chattering which may clearly be heard by the driver if steps are not taken to attenuate this noise.
10

15 The noise may be transmitted both through the air, and by vibrations travelling along the steering shaft. Additional noises may also emanate from the engine compartment which are transmitted into the passenger compartment through an aperture in the vehicle structure necessary for the steering shaft.
20

Typically, these problems have been overcome by means of a static seal which cooperates with the steering shaft and
25 is fixed to a surface of the vehicle structure. An inherent problem with a seal of this type is that parasitic friction occurs between the steering shaft and the seal and results in an additional source of noise.
30

According to the present invention there is provided a noise attenuation arrangement for attenuating noise transmitted from an engine compartment to a passenger compartment separated from the engine compartment by a bulkhead, wherein a steering shaft passes through an
35 opening in the bulkhead and a baffle is mounted on the

steering shaft adjacent to the bulkhead, the diameter of the baffle being greater than that of the opening in the bulkhead.

5 It is preferred that the baffle is manufactured from a noise absorbent material, such as a resilient elastomeric foam. However, the baffle may comprise a rigid shell and a lining, which may be a lead lined high density foam. The shell is intended to absorb noise and vibrations in
10 the lower frequency ranges, and the lining is intended to absorb noise and vibrations in the higher frequency ranges.

15 The baffle is preferably mounted on the steering shaft so that it will rotate as the steering shaft rotates. This avoids any parasitic friction between the seal and the steering shaft. A free space is preferably provided between the baffle and a surface of the vehicle structure so that friction is not introduced into the steering
20 apparatus.

25 A blanking plate may be fitted into the opening in the bulkhead, and preferably has an annular collar which extends upwardly between the steering shaft and the inner surface of the shell. The size of the collar is such that it does not make contact with the baffle so that friction is not introduced into the steering apparatus.

30 The outer diameter of the collar is preferably less than the internal diameter of the shell, so that the shell may receive the collar internally.

35 The baffle may be designed to accommodate a shaft coupling, and therefore the lining may be contoured so that the shaft coupling is snugly received.

The invention will now be further described, by way of example, with reference to the accompanying drawings where;

5 Figure 1 shows a cross-sectional view of a noise attenuation arrangement in accordance with the invention on a motor vehicle; and

10 Figure 2 shows a cross-sectional view of a baffle in accordance with the invention;

15 Figure 1 shows a noise attenuation arrangement in use upon a motor vehicle. During the assembly of the motor vehicle the steering shaft 10 is connected to an integral unit comprising the steering apparatus and the suspension by a shaft coupling. The steering shaft 10 therefore must pass through an aperture in a bulkhead of the vehicle structure which separates the engine compartment 14 from the passenger compartment 16.

20 Typically, the opening must be significantly larger than the outer diameter of the steering shaft 10. The outside diameter of the steering shaft 10 at the point which aligns with the aperture in the bulkhead is therefore less than the inside diameter of the aperture. This leaves an opening through which noises may travel from the engine compartment 14 into the passenger compartment 16.

30 A blanking plate 38 is therefore placed around the steering shaft 10, and secured into the aperture. A small gap is left between the blanking plate 38, so that friction does not occur between the steering shaft 10 and the blanking plate 38. However, this gap does not prevent the ingress of noises into the passenger compartment.

Figure 1 shows a baffle 22 and a blanking plate 38. The baffle 22 is mounted upon a steering shaft 10 which passes through an opening 36 in a blanking plate 38 of the vehicle structure, the steering shaft 10 being connected 5 to the steering gear housing 32.

A shaft coupling 30 is mounted upon the steering shaft 10, the shaft coupling known as a Noise, Vibration and Harshness (hereinafter referred to as NVH) coupling 10 comprises two plates separated by a resilient disc of elastomeric material such as rubber. The disc is intended to absorb vibrations transmitted through the steering shaft 10, preventing the vibrations from reaching the driver through the steering wheel.

15 The baffle 22 comprises a shell 24 typically manufactured from a rigid elastomeric material, and a lining 26 manufactured from high density foam. In the preferred form the baffle 22 comprises an upturned cup which is placed over an end of the steering shaft 10 so that the coupling 30 is enclosed between the baffle 22 and the blanking plate 38. The lining 26 may be shaped so that it does not contact the collar 34, and is caused to distort by the insertion of the coupling 30 into the shell 20 24, so that the high density foam assumes the shape of the coupling 30.

The blanking plate 38 has an annular collar 34 which extends upwardly into an open end of the shell 24. The shell 24 is secured above the blanking plate 38 so that the baffle 22 does not contact the blanking plate 38 which 30 may lead to friction. Any noise originating in the engine compartment 14, or from the hydraulic valves of the power assisted steering must travel along a convoluted route to 35 enter the passenger compartment 16 (indicated by arrow A),

resulting in noise attenuation.

Mechanical noise from the power assisted steering valve, and noise originating from other sources such as the coupling 30 are absorbed by the baffle 22, or are attenuated as there are a minimal number of possible noise paths into the passenger compartment 16.

Figure 2 shows a baffle 22 with a rigid outer shell 24 preferably manufactured from a resilient material noise absorbent material. Particularly suitable materials for this application are plastics. A lining 26 of an elastomeric material, such as lead lined high density foam, is secured into the shell 24 so that the baffle 22 forms an integral unit. An aperture 28 passes axially through both the shell 24 and the lining 26. The lining 26 may be shaped in accordance with the outline defined by the coupling 30.

CLAIMS

1. A noise attenuation arrangement for attenuating noise transmitted from an engine compartment to a passenger compartment separated from the engine compartment by a bulkhead, wherein a steering shaft passes through an opening in the bulkhead and a baffle is mounted on the steering shaft adjacent to the bulkhead, the diameter of the baffle being greater than that of the opening in the bulkhead.
5
2. An arrangement as claimed in Claim 1, wherein the baffle comprises a noise absorbent material.
- 15 3. An arrangement as claimed in Claims 1 or Claim 2, wherein the baffle comprises a hard shell and a lining, the lining being a noise absorbent material.
4. An arrangement as claimed any one of Claims 1 to 3, wherein the baffle rotates with the steering shaft.
20
5. An arrangement as claimed in any one of Claims 1 to 4, wherein a free space is provided between the baffle and a surface of the vehicle structure.
25
6. An arrangement as claimed in any one of Claims 1 to 5, wherein the opening in the bulkhead has a blanking plate, the blanking plate having an aperture through which the steering shaft passes.
- 30 7. An arrangement as claimed in Claim 6, wherein the blanking plate has an annular collar, the diameter of the collar being less than that of the baffle, the baffle being adapted to receive the collar.
35

8. An arrangement as claimed in any preceding claim,
wherein the baffle is adapted to accommodate a shaft
coupling.

5 9. A baffle for use in an arrangement as claimed in any
preceding claim.

10. An arrangement substantially as herein described with
reference to the accompanying drawings.

10 11. A baffle substantially as herein described with
reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

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Relevant Technical Fields		Search Examiner JOHN TWIN
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(ii) Int Cl (Ed.5) B60R 13/08; B62D 1/16, 25/14, 25/20		Documents considered relevant following a search in respect of Claims :- 1 TO 9, 11
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASE: WPI		

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
- Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
- A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2055712	(DEERE)	1 at least
A	US 4892002	(FORD)	1
X	US 4216842	(RENAULT)	1 at least

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